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approach

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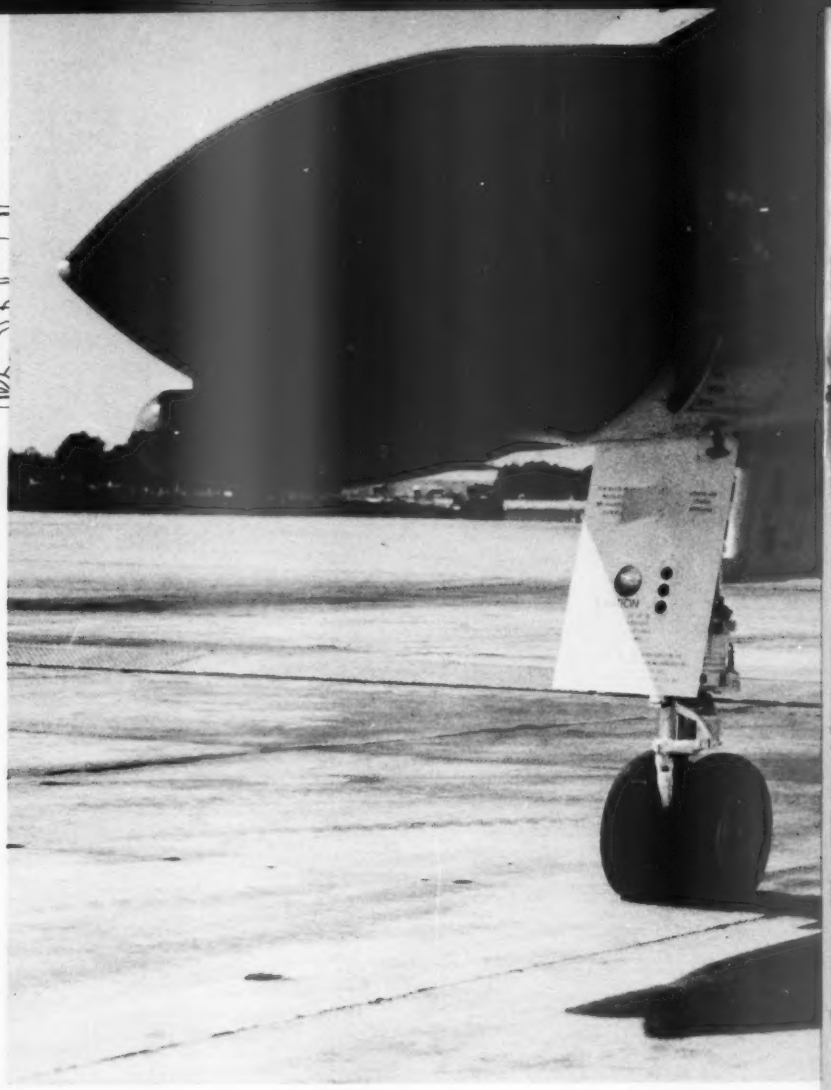


F-4 NGS

(Nose Gear Steering): AN ENIGMA

By MAJ C. M. Lacroix
Naval Safety Center

MUCH has been written on the employment of this system since its inception in 1961. Among these periodic exchanges are two that appeared in separate issues of the McDonnell Douglas Product Support Digest, one in the second quarter, 1970, and another in the fourth quarter, 1972.

In addition to the aforementioned articles, the MAY '72 Cockpit CROSSFEED also contained an analysis of F-4 runway retention problems plus a summary of recommended preventive actions.

The comments contained herein are based on 2½ years of analysis of these mishaps at the Naval Safety Center by the author and are intended to further these discussions and shed additional light on the controversy over nose gear steering employment.

First, some background on the development of the system as we know it today.

During the original BIS trials in 1961, the need for a reliable ground handling/shipboard maneuvering aid was quite apparent. This requirement resulted from the combination of a wide MLG track, dual NLG tires, and the forward CG load distribution of the F-4. (In short, a

taxi-turn before NGS was similar to driving a two-wheel dray with the donkey installed backwards.)

After its incorporation, the NGS, as is the way with most new items, became the object of *informal* experimentation at higher and higher taxi speeds until such time as it was finally utilized as an accepted procedure during takeoff and landing. Even then, the warning signs began to appear in the form of spurious inputs which caused directional control problems and eventually required additional moisture proofing to provide a degree of reliability.

From those early years up to the present, there have been no formal test programs related to NGS employment throughout the spectrum of F-4 ground operation.

So, where are we? Well, the *Phantom* community of today, as it has been in the past, is not wholly in agreement as to the primary means of directional control, *regardless* of what is contained in NATOPS. You guessed it. It's the "NGS school" versus the "aerodynamic control/braking-as-required school" during the takeoff/landing phases of flight.

The irony of it all really comes home when you consider that these areas are historically right at the top where F-4 pilot error and hazard potential are concerned. It would appear, then, that we can ill afford any differences of opinion where these phases are involved.

Regarding the rest of the F-4 world, the Israelis and United Kingdom limit use of NGS to taxi speeds and emergencies only. It is also noteworthy that the USAF, a service long known for full spectrum NGS usage on tactical aircraft, has seen fit to limit the F-4 to 70 knots (and below) engagements. On the other hand, there are no specific airspeed limitations contained in our NATOPS. Perhaps this is due to the existing schools of thought mentioned earlier.

Of the nine recorded major accidents involving runway departures since the MAY '72 CROSSFEED article, two aircraft were damaged by engaging a faulty NGS at 80-90 knots. Mr. J. Krings, in his Product Support Digest articles, is a proponent of "beeping" the NGS and reengaging during rollout, a procedure that the Safety Center strongly disagrees with.

The system was not designed for a high speed capability. Employing the unit beyond its design limits has no doubt contributed to its unpredictability in a prolonged operational environment.

The Naval Safety Center is not anti-NGS per se, as it certainly has practical applications. Nevertheless, we need only to look at the many successful recoveries with utility hydraulic failure to realize that use of NGS is not necessary when it comes to "flyin' the airplane" (provided that basic aeronautical skills and coordination are applied).

The USAF is concerned about system reliability to the point of investigating a design that would convert to a servo-mechanical concept. Based on the foregoing, we believe that it is high time that the *Phantom* NGS be placed in the operational perspective for which it was intended – that of low forward velocity and emergency use. Otherwise, the runway departure totals will continue to include unnecessary NGS malfunctions which occur above normal taxi speeds.

Off the Runway

THREE F-4N aircraft launched from USS BOAT on a flyoff to an overseas base. Weather at the base was forecast to be 1500 scattered, 3000 broken, 5000 overcast, 2 miles visibility in rain, winds calm.

Although it was solid IFR at cruising altitude, the flight was uneventful until reaching a point about 50 miles from the field, at which time the "trection" was broken up for individual approaches. Approach control then advised that weather was 400 feet overcast with 1 5/8-mile visibility in rain. The winds were given, but because of language difficulties with the foreign controller, they were not understood.

The first aircraft made a GCA without incident until after breaking out at 400 feet, ¾-mile from the field. At this point in the approach, the RIO asked the pilot if he was going to use the drag chute. The pilot replied "affirmative" and then changed his mind. He was influenced to some extent by the fact that he did not know the wind velocity and that braking action on the 10,000-foot runway was reported as good.

The aircraft touched down on centerline near the approach end, on speed. Both throttles were reduced to idle, but the drag chute was not deployed. The pilot used some aerodynamic braking until the RIO called 100 knots and 4500 feet of runway remaining. At this point, light braking was commenced. As brake pressure was increased, the nose of the F-4 started to swerve right. Left brake and left rudder corrections were not effective. The pilot centered the rudder pedals, selected nosewheel steering, and applied left rudder. The nose of

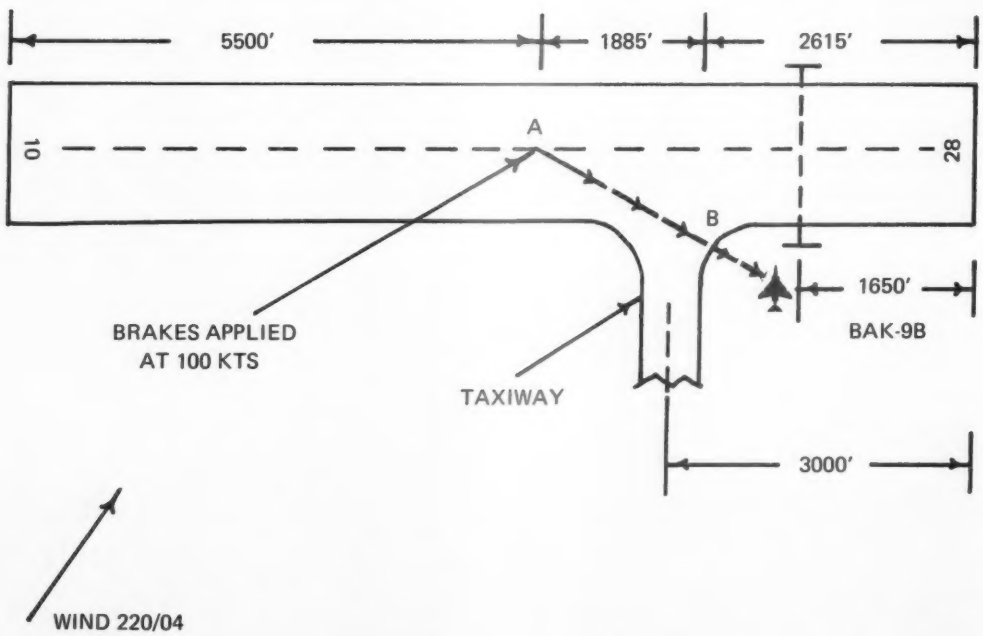


Diagram depicts the path of the aircraft from runway centerline to final resting place. Point A is the point where skidding was initially observed by the aircrew. This was at about 100 knots with 4500 feet of runway remaining. Point B shows the point at which the aircraft departed the taxiway.

the *Phantom* eased left, but because of its momentum, the overall movement of the aircraft was toward the right edge of the runway (see diagram). The nose continued left until the aircraft was sliding sideways. It departed the runway edge with 3000 feet of usable runway remaining and slid 200 feet through the grass, sustaining major damage. Engines were secured, and the crew exited the aircraft uninjured.

The commanding officer, in his endorsement to the AAR, stated in substance:

The pilot was placed in a far from ideal situation because of inadequate weather/runway information, poor field facilities (only a BAK-9 arresting gear), and difficulties communicating with foreign controllers. The single most salient point, however, is that he lost control of the aircraft in a situation which should have been within both his and the aircraft's capabilities. Specifically, the F-4B/N NATOPS manual states that, even on dry runways, the brakes should not be applied until under 100 knots. The manual further states in a caution note that brake pedal deflections as small as 1/16-inch at high speeds have resulted in blown tires. In this accident, the pilot's use of brakes at 100 knots on a wet runway is highly questionable; and in this endorser's opinion, control of the aircraft was lost at that point.

Additionally, although not specifically addressed in NATOPS, shutting down the port engine in F-4B/N aircraft has proved most effective in aiding landing roll deceleration. Obviously, this procedure reduces idle thrust by one-half. The major drawback, however, is the loss of go-around capability. (No test data is available on the effect on landing rollout of shutting down the left engine. – Ed.)

All pilots are very familiar with nose gear steering feel and response at taxi speeds. Nevertheless, most have little experience with nose gear steering at the higher landing rollout speeds where sensitivity and response are much greater and where malfunctions and improper technique, such as rudder pedals not exactly neutral on engagement, are potentially disastrous. This endorser believes that nosewheel steering should be used only as a last ditch measure because of its potential for aggravating, rather than alleviating, directional control problems at most rollout speeds. (See "Clarification" in February '74 APPROACH letters. – Ed.)

This accident, like many others which have occurred recently during the landing rollout, suggests that not all pilots are retaining the *bubble*, i.e., failure to plan each landing and carefully control the aircraft from touchdown to shutdown (in the chocks, that is). ◄

Two Million Americans Have Never Seen the Elephant

IF the circus should disappear from the American scene, it would mark the passing of an era. Although it hasn't changed much – same old clowns, animals, stunts, and ballyhoo – we should all be compelled to see the circus every year because it's a great lesson. Yep, same old elephant, only a year older; but remember, since last year's circus, over two million babies are now old enough to appreciate a circus.

So, you sometimes get tired of the same old routine about safety, fire protection, passenger protection, and all the problems that go with them! So do we, but there are a lot of new people in our ranks since last year, too. That's one reason we keep going over the basic stuff. You may be bored with the same old elephant, but from a lot of people, we hear, "So that's an elephant!"

TV, which is reported to be a principal cause of the circus' troubles, uses the same technique of repetition. They have the same self-renewing audience.

The moral of this story is – no one really ever knows all there is to know about anything – especially about the subject of preventing accidents, and no one ever will. As soon as anyone reaches the point where there's nothing new to learn about a job, it's time to look up an undertaker because it's the start of the dying process.

In fact, statements like "I'm too smart for that stuff" or "I've forgotten more than most of 'em will ever know" should be listed among "Famous Last Words." We know it's true, because every day supposedly experienced people do some awfully silly things that result in accidents.

National Safety Council

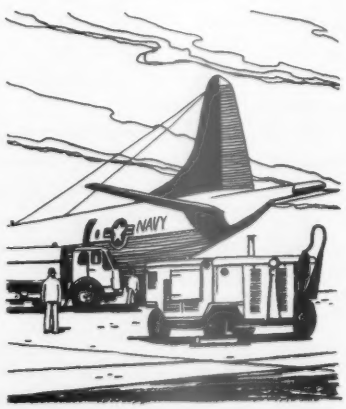
AIR BREAKS

Oversight. After a P-3 lifted on a reposition/logistics flight, the copilot raised the gear handle. The landing gear indicators did not move, so the handle was lowered. Simultaneously, the flight engineer informed the PPC that he had failed to pull the landing gear pins.

The PPC turned downwind and landed at 113,000 lbs. The aircraft taxied clear of the duty runway and stopped while the flight engineer pulled the gear pins and made an overweight landing inspection. The aircraft then proceeded as planned.

The cause is simple: failure of the flightcrew to ensure removal of the gear pins. As with many other mishaps, there was a break in the habit pattern which led to the incident. The flight engineer responsible for removing the gear pins purposely did not do so at the beginning of his outside preflight because of the number of people around the aircraft. The aircraft was being fueled, a bomb bay carryall was being installed and loaded, and numerous ground personnel were loading toolboxes aboard. In addition, maintenance was being performed on the aircraft.

As the ground activity decreased, the flight engineer came aboard to help secure equipment and complete the paperwork. His eagerness to "get it all done" caused a break in standard operating procedures.



The copilot performed his outside preflight of the aircraft at the same time the aircraft was being fueled and loaded. He noticed the pins installed.

Preoccupied with last minute details inside the aircraft and in maintenance control, the PPC failed to check the gear pins.

The commanding officer of the squadron stated:

"Hard to believe, but it happened again. The reason – deviation from SOP. Flightcrews must consistently follow standard procedures. They cannot allow anything to deter them from correctly performing all tasks. Expediency is not a valid excuse/reason for disregarding standard procedures, be it during preflight, flight, or postflight.

"In addition to the gear pins, the PPC also made two serious errors in judgment:

1. He elected to land at 113,000 lbs rather than burn down to less than 105,000 lbs.

2. He flew the aircraft without a proper overweight landing inspection even though both individuals who performed the inspection were qualified to sign off the gripe.

"Both actions again violated standard operating procedures and were entirely unprofessional. The professional approach would have been to have buried one's pride, burned down to landing weight, and returned to the hangar. This is, of course, easy to say after the fact, for the embarrassment is so acute that one tends to forget what should really be done. I know, I did the same thing 10 years ago only at max gross weight and in marginal weather.

"Though it is one of life's most humiliating moments, a professional will not lose his head,

but will follow established procedures to ensure the safe return of the aircraft and crew. How many pilots are no longer with us because they let pride overcome headwork and safety?"

Induced Flameout. During day carquals, an E-2B and several F-4s were in the landing pattern together. The E-2 was completing quals, and the F-4s were just commencing theirs.

As the *Hawkeye* crossed the ramp, an F-4 on the port (No. 2) catapult was turning up at MRT. The E-2B approach resulted in a bolter. As the aircraft passed through the *Phantom's* exhaust, the starboard engine flamed out because of a sensed overtemperature condition. The engine relit when RPM decreased to 60 percent, and the only difficulty encountered was a pronounced swerve to starboard which the copilot (instructor) assisted in controlling.

After the engine had stabilized at normal power, the instruments revealed no continuing malfunction. The cause of this incident was the simultaneous recovery of turboprop aircraft while launching jet aircraft on the port catapult.

The CVA/CVS NATOPS contains a specific prohibition, borne of numerous hazardous incidents, concerning the launch and recovery of turboprop aircraft when jet exhaust is directed into the flightpath of turboprop aircraft.

Landing Blind. The pilots had been in the LZ several times helping Forestry Service personnel fight a large forest fire. All zones in the area were at 6000 feet or higher and were covered with a layer of dust. Each time the helos landed, they were engulfed in dust clouds.

The CH-53 was in a 25-foot hover after making an approach into a 6400-foot high LZ. While letting down, the LZ went IFR in dust, restricting visibility in all directions.

At about 10 feet above the ground, the tail rotor blades struck a pile of logs and debris at one end of the zone. Severe vibrations were felt by the pilots, but they had no control difficulties. They quickly landed the helo.

The four tail rotor blades were changed in the zone, and the aircraft was inspected for further damage. None was found at the time, and the helo was flown back to base. There, a more thorough inspection was conducted, and the upper left mounting bracket of the tail rotor gearbox was found to be cracked completely through.

The pile of logs and debris had been called to the attention of ground personnel in the LZ, and they had been asked to remove the hazard. They weren't removed.

Too *&$*! Low. To approach and land aboard aviation facility ships, particularly a DE, is a precise maneuver. The copilot of an SH-2D was making such an approach. As the aircraft crossed the flight deck from port to starboard in a slight descent, the tailwheel struck a folded HF antenna. Echo damage resulted.

The pilot was too low on final.

Challenge and Reply. A multiengine transport was flight tested after a prop governor change and then used to shoot approaches and landings as part of the copilot's refresher training.

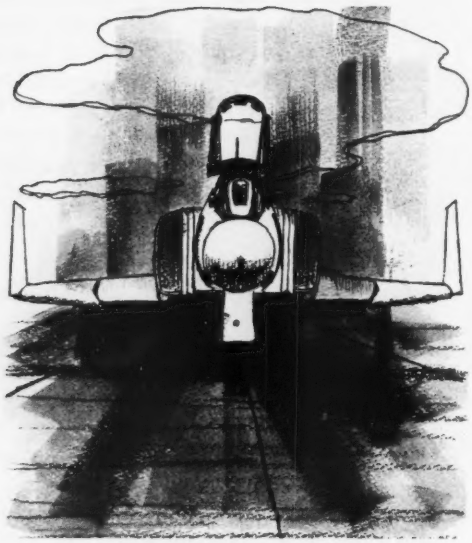
Completing the descent checklist, blowers were shifted to high for desludging. At that time, the checklist was interrupted. Both pilots and the flight engineer diverted their attention to crossfeed which was being used to equalize fuel imbalance.

The checklist was then continued (blowers in high). The flight engineer didn't get a reply to "blowers" and completed the checklist. The pilot continued his approach, but the No. 1 prop only went to 2300 rpm when put in low pitch. Instead of a touch-and-go, the pilot requested and received permission for a full stop.

After repeated ground checks (with no one the wiser), a decision was made to return to base. The turnaround checklist was completed, followed by takeoff. The problem was subsequently solved during the descent checklist for final landing.

The No. 1 engine had to be changed because of overboost, but the No. 2 engine inspection revealed no damage.

"Challenge and reply" means just that. If you're challenging and don't get the proper reply, challenge again . . . again . . . and again. ◄



GOTCHA!

By CDR W. F. Bankowski
Naval Safety Center

THERE'S a TV ad that depicts a rather smug cigar smoker with a sly smile who warns, "Sooner or later, you'll smoke a BEEP BEEP, and when you do . . . WE GOTCHA! You just know we're gonna getcha!"

In quite the same way, you should be warned about the *Phantom*. Sooner or later, you'll preflight or fly the F-4, and when you do . . . it'll GETCHA! Maybe not today or tomorrow, but you just know it's gonna GETCHA! That is, unless you meticulously watch your step and are continually aware of the many metal tentacles just waiting to . . . GETCHA!

As you scramble out of the readyroom into the dimly lit passageway where shin meets cursed knee-knocker, you begin to wonder if this is going to be one of those nights. Up the ladder in almost inky darkness you miss tripping over the scupper, finally reaching the "safe," flat flight deck. There, your F-4 quietly waits. But, be wary of those sly invisible tiedown chains holding your beast at bay.

You start with the close quarters of the nose wheelwell full of pressure gages, actuators, etc., and feel relieved that your helmet has saved your head until, as you swing out, you come face to cone with the angle-of-attack probe.

From there, you crouch and cower in the main wheelwell watching for gear doors, aux air doors, the nose of the centerline tank, missile racks, fins, and other probing extensions of metal.

You have to move slowly out of this area, otherwise, a "winder" fin or the sharp break at the wingfold will GETCHA. Very slowly and carefully you pass the wing dump mast and on to the flaps and the Sparrow missile fins.

Your gloves prevent pinched fingers as you work the turkey feathers at the engine exhaust. To the rear . . . march . . . ouch! . . . that stabilator . . . oh well, at least that elephant trunk hook shank is locked up there. If that thing gets you, you don't have to worry about anything else.

The port side of the F-4 obstacle course is almost a repeat of what you didn't miss on the starboard side, and you are relieved to reach the cockpit area. As you mount the ladder, you hope the rung has no fatigue cracks. People have been known to break ankles on that unexpected fast trip downward.

Ah! At last, the comforting womb of your phriendly cockpit. Nothing to worry about now except pinched fingers as you close the canopy. (Must remember to tell the pilot that the radar technician is up here so he doesn't knock off the poor soul with the inflight refueling probe door. That's a double dirty because as a person is knocked off by the opening door, he grabs it to hang onto only to have his fingers pinched as the pilot, realizing what he's done, closes the door.)

Now you're ready to taxi. If the director doesn't taxi you into another aircraft or the JBD . . . or jet blast doesn't further fold your wings . . . or the cat officer doesn't suspend, you can be pleasantly propelled into the horizonless ink. Then, it's merely looking forward to the orderly calm, smooth, quiet confusion of a night carrier OK 3 landing. Oh yes, don't forget that dimly lit passageway and your previously bruised shins.

The F-4 has been around for a long time, but familiarity can breed contempt. Crewmen and maintenancemen have been pinched, propelled, gored, squeezed, nicked, cracked, sucked up, and gouged by the aircraft for nigh on 10 years. Flaps and hooks have zapped the unwary during preflight. Sparrow telemetering antennas have punctured lungs as ordnancemen have backed into them. Hot BLC air at the wingfold has caught people, and more than one green shirt has thanked Uncle for those steel-toed shoes as nosewheels and mainmounts rolled over them.

The stories of the *Phantom*, or any aircraft for that matter, go on and on. As in any evolution, the careless get caught. Just don't be one of those careless ones. Remember, sooner or later you'll fly a *Phantom*; and when you do, keep your eyes open and your mind alert, because if you don't . . . IT'LL GETCHA!

In Which an Engine Is Restarted

(or was it?)

By LT Anthony R. Thompson
VC-8

THIS article is X-rated – its use is intended for anyone adult enough to admit that he might not know everything there is to know about the R1820.

Two aviators were on a local training flight out of NAS Island. The plane commander was an experienced LT with 450 S-2 hours. The pilot under instruction, an ensign, had recently reported from the training command.

The syllabus flight called for single-engine practice and was going smoothly when the instructor pilot secured the starboard engine by pulling the mixture to IDLE CUT OFF. The aircraft was at 5000′ MSL. The engine was shut down IAW the inflight secure checklist, and ENS Trainee practiced single-engine airwork for 10 minutes.

Preparatory to restarting the engine, the checklist was consulted, and soon the prop was observed to be turning.

Warmup RPM and MAP were set, and our aviators sat back and waited for 100 degrees CHT . . . and waited . . . and waited. CHT was slow to come up. (It had only risen from 65 degrees to 90 degrees, yet 100 degrees is the required minimum.)

Becoming suspicious, the PC tried some inflight troubleshooting beginning with a review of the checklist items. He took control of the aircraft while the ensign reviewed each item to their satisfaction. Something was still amiss.

Meanwhile, the S-2 was falling out of the sky, so maximum continuous power was applied to the good engine.

On the bad engine, the PC moved the prop lever to full increase, getting 1600 RPM, and to full decrease, getting 1100 RPM. Throttle movement gave 25 inches MAP at 1600 RPM, but was pushed no further because of fear of overboosting the engine. Suspecting a prop governing malfunction coupled with a possible loss of power, the PC decided that it was time to return to base. Now at 3000 feet, the checklist was again consulted as the two mind-boggled aviators secured the engine "one more time."

ENS (reading checklist) queries – "MAGS."

LT (looking over to see the mag switch already off) replies, "No. 2 mag OFF." (That's it! – it was OFF all along!!)

For the purposes of this tale, let's dismiss the obvious misuse of the checklist/lack of crew coordination and look at the engine which of course had ground checked and flight checked 4.0.

How do you know when your engine stops developing power? Easy!!!

1. Swerve into the bad engine (with resulting opposite rudder pressure).
2. Drag from windmilling prop requiring more power to maintain altitude.
3. CHT oil temp readings (will slowly drop).
4. RPM and MAP will not respond to full power setting.
5. Feather warning light.

How do you know when your engine is running after an inflight restart? Not so easy!!!

1. Rise in CHT, oil temp (slowly).
2. Throttle response on MAP gage.
3. Prop governing effective.

Now, just suppose the MAGS are off, which of the above will you see? Your RPM and MAP will respond to prop and throttle movement as you "set power" to "warm up" your engine at 1500 RPM and 18 inches MAP. *But*, you won't feel a change in rudder pressure as the "power" comes on. And your CHT – there won't be a rise. By the way, forgetting to set your mixture control will produce the same negative results.

If you know all of this, you're ahead of the game. Congrats! If not, you are like many of the pilots in this squadron who were not in complete agreement as to what the cockpit indications are for a windmilling engine.

Moral?

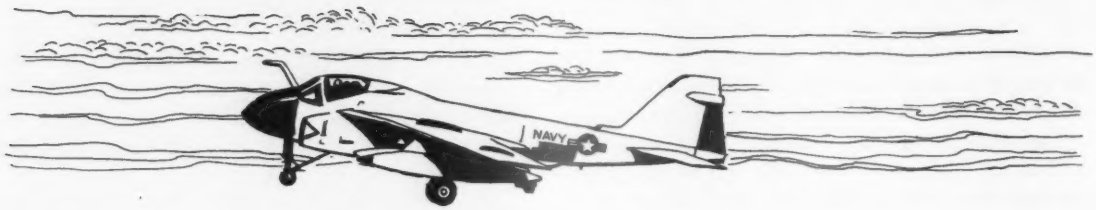
1. Know your aircraft systems.
2. The checklist is a two-man evolution if used properly – the person reading the checklist must also visually check while items are being complied with.

(Don't bury your head in the checklist, you may bury yourself with it.)

3. There is no substitute for proper crew coordination.

The benefits are usually taken for granted. The consequences are often costly. ◄

"On Glidepath,



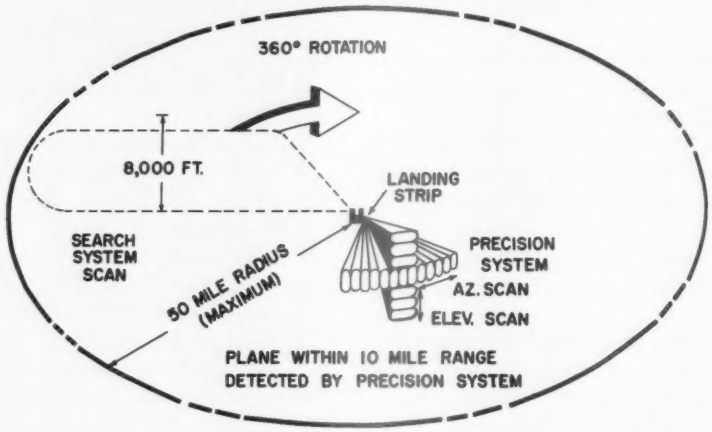


Fig. 1

"AT DECISION height." This GCA controller's phrase signals the point where a pilot can take over visually (weather permitting) and complete a successful landing under minimum weather conditions. GCA – that's the key. For simplicity, it can't be beat. There's no extra instruments to scan or interpret, but one feature makes it distinct from all other low approach systems. It is a double man-machine relationship: the pilot plus his aircraft, and the controller plus his radar scope.

Considering this double man-machine relationship, an understanding of the controller's duties, his equipment, and some thought about the techniques involved may be useful to you, the pilot, in future GCAs.

The tools of the GCA controller are a search radar, precision radar (consisting of two units), and a communications system. Typically, the search radar has a 360-degree sweep with a maximum range of 36 to 50 miles. The equipment is capable of picking up aircraft at altitudes up to 8000 feet with normal antenna tilt.

Typical precision radar has a range of 10 miles. Target information from the azimuth antenna shows your relationship to the centerline of the duty runway and scans a 20-degree area. Target information from the elevation antenna shows your position relative to the glidepath and scans an elevation area of 7 degrees. Figure 1 shows the general layout and coverage of GCA.

Each of the radar systems has a separate scope, as illustrated in Figs. 2 and 3. The search radar, in addition to locating and directing aircraft into position for a precision approach, is also used for ASR (airport surveillance radar) approaches whenever necessary.

The real heart of the GCA system is the precision scope. Although the precision radar has two separate antennas, one sweeping vertically (elevation) and the other horizontally (azimuth), the patterns of both are presented on one scope. Known as the "AZ-EL" scope, the glidepath is shown on the upper half and the runway lineup on the lower half.

Since the normal approach angle (glidepath) of the

On Course"

aircraft is 3 degrees or less, deviations above or below this course could pass undetected. To overcome this, the scope presentation is expanded and magnified. The vertical movement of the target on the glidepath is magnified 10 times, making it possible to detect deviations of one-tenth degree. Since greater deviations can be tolerated in azimuth than in elevation, the azimuth radar "picture" is magnified only six times.

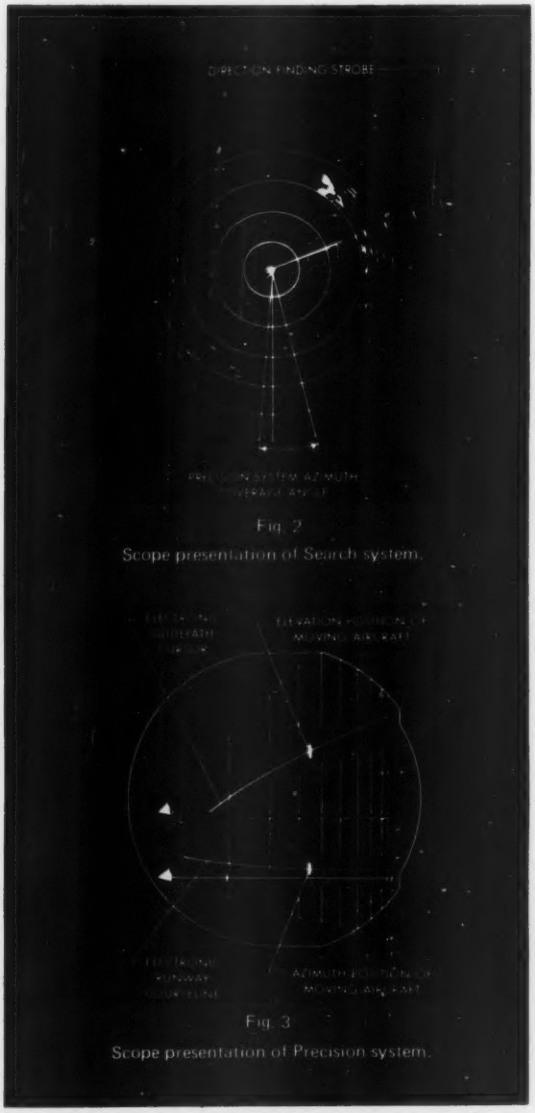


Fig. 2
Scope presentation of Search system.

Fig. 3
Scope presentation of Precision system.

When an aircraft is directed into the area covered by the precision radar, the resulting "pip" of light on the AZ-EL scope resembles a slightly overgrown grain of rice. New pips are "painted" on the fluorescent-coated scope as the aircraft moves ahead, and a fading trail of previous indications is left behind.

The final controller has problems similar to a tightrope walker as he tries to keep one pip of light centered on the glidepath and another on the centerline, but he is limited to oral directions, anticipation, and "body english" to get the aircraft in the right spot.

It is standard technique for the GCA controller to inform the pilot of his position relative to the runway/centerline, such as "Slightly left/right of course" or "On course." Another item sometimes given the pilot is his apparent drift ("No apparent drift"), and some controllers transmit a reminder about the crosswind if time permits.

This is why controllers appreciate smooth and accurate instrument flying, particularly when making corrections. For each instruction received by the pilot, the radar equipment must first transmit and receive a pulse, then paint a target. The controller then observes the change in scope presentation and determines the *trend.* From this he *predicts* the next move the aircraft will make. This information is transmitted to the pilot in the form of corrections to which the pilot is expected to respond smoothly and precisely.

By the time the pilot is squared away on this latest instruction, the radar target has already been painted several more times on the scope; and unless the pilot is properly aligned or approaching the proper alignment, it is already time for another correction. A wandering flightpath or nonstandard rate turn makes it harder for the controller to establish the flightpath trend and correct it so as to coincide with the desired glidepath.

Another subject close to the hearts of controllers concerns corrections of heading and glidepath. They stress the necessity for the pilot to act on *all* corrections at the *time* they are given. If a small correction is ignored or delayed, it is only a matter of seconds until a much larger correction is required, leading to the

possibility of a porpoising flightpath late on the glide slope (the worst possible time).

The majority of Navy and Marine Corps glidepaths are between 2.5 and 3.0 degrees. A few, however, are as steep as 3.5 degrees. The final approach normally begins 7 miles from the field with the aircraft level at MEA or MVA. The 3-degree glidepath is intercepted about 3 miles from the GCA touchdown point. The accompanying drawings show how the controller starts the aircraft down the glidepath.

As the aircraft transitions into its descent, the controller can determine whether an adjustment is needed. "On glidepath" is the objective, but corrections may be required. Fill-in transmissions attempt to present the pilot with a picture of what is occurring. For example, if slightly high and correcting, you might hear one of these three phrases: "Slightly above glidepath and coming down" . . . "Slightly above glidepath and coming down slowly" . . . "Slightly above glidepath and coming down rapidly."

After intercepting the glidepath, the controller transmits approximately 75 percent glidepath information and 25 percent azimuth and range information. Ranges on final approach are called at least once each mile, down to the field, including a call "Over approach lights" and "Over landing threshold."

The only indication the operator has of the aircraft's position is its relation to the cursor lines (glidepath and centerline) on the scope. A missed approach will be ordered when the controller observes the aircraft outside of prescribed azimuth or elevation limits or if a safe landing is questionable for other reasons (fouled runway, etc.).

During the last mile of the approach, alignment is critical and a rapid or radical deviation from centerline may indicate a sudden wind change or poor pilot technique; in either event, a missed approach will be ordered if the trend off course is significant.

Close in, a deviation of more than ½-degree from the glidepath is used as the limit in deviation from glide slope. From ½-mile out to the end of the approach, a waveoff is ordered if the target is not touching the cursor lines. Also, any time the target goes rapidly below the glidepath, the controller will order a waveoff. The waveoff is mandatory unless the runway environment is clearly in sight (the waveoff becomes advisory if the latter condition exists).

A rapid descent below the glidepath in the final stages of the approach is rather common, according to controllers. It usually means the pilot has broken out in VMC and feels he has the runway made and the descent is an adjustment of flightpath to provide an earlier touchdown.

Interpreting the Glidepath

Altitude 1000 feet AGL. Maintaining heading to keep on centerline.
When the top of the pip touches the glidepath, the pilot is told "Approaching glidepath . . . begin descent."
Controller mentally divides pip into thirds. The top third is above the glidepath, and he says "... below glidepath ... coming up slowly."
Having made adjustments to begin the descent, there is no need for concern about being below the glidepath at this point. Inertia prevents the aircraft from instantly changing from level to descending flight, and the controller is simply reporting what he sees. His next words will be the reassuring "... on the glidepath."

At night or with precipitation blurring the windscreen, or if the stopping distance is absolutely known to be more than adequate for conditions, the conservative (safe) procedure is to *fly the GCA to touchdown.* It is good precision flying practice.

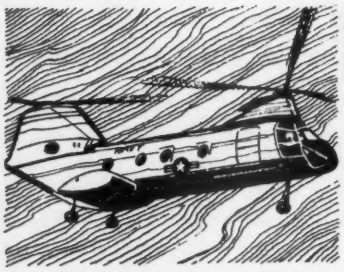
There are several reasons for this. During darkness or reduced visibility, depth perception is impaired, directly affecting the pilot's ability to measure height. Since GCA touchdown points are usually 500 to 1000 feet from the end of the runway, holding the rate of descent that kept you on glidepath aims the aircraft at the GCA touchdown point and insures against undershoots.

Once the aircraft has passed decision height, the controller provides *advisory* information only. As long as the aircraft is within position limits, he will provide advisory course and glidepath information until the aircraft passes over the landing threshold.

With a crosswind, the controller must apply enough drift correction to keep the target tracking directly into the runway centerline. According to controllers, this drift correction has caused pilots to mistakenly assume they were not lined up properly when breaking out in VMC. This illusion is caused by the pilot looking dead ahead through the windscreen and, due to drift correction angle, seeing the runway centerline or runway lights off to the side. In the event drift correction is abruptly removed by a turn to the runway heading, drift will commence before touchdown, causing landing problems. A missed approach may even be necessary. So, don't be in too much of a hurry to change the heading that has brought you down the centerline.

GCA is the Navy's primary method of recovering aircraft during conditions of low ceilings and visibility, but it is not a zero-zero system. Thus, it is important to recognize its limitations and adhere to minimums.

Although GCAs may be made by a pilot who has never attempted one before – saves have been made with civilian pilots in everything from piper cubs to multiengine transports – don't be misled. Practice is profitable. Know the procedures for your aircraft and its characteristics on the glidepath and practice until you can fly "On glidepath, on course" all the way down. ◄



YOU GOT IT

ONE of the first lessons all prospective aviators have drilled into their heads is how to pass control of an aircraft from one pilot to another. It isn't a complicated procedure and, once learned, is never forgotten. How could anyone screw up anything as simple or basic as that? Here's how.

The right seat trigger switch in our H-46 was intermittent at best, and the radio detent was inoperative. But we took the helo just the same. I mean, what the hell, who would down his bird for a little thing like that? What was our mission? Oh, a short, night VERTREP.

I was in the left seat and would make all radio transmissions. After a few routine drops (Routine at night? Never!), the tower asked us to pick up some retrograde. I said, "Partner, do you want to pick up some retro?" (I meant for him to pick it up.) Unfortunately, his ICS chose not to work, and his hand on the cyclic (while using the ICS) was all I needed to give him control. I sat back and relaxed a bit.

Would you believe the aircraft, exactly as if someone were at the controls, backed off the flight deck until our rotor blades passed over the deck edge. Then we began a rapid descent. On the way down, I said, "Watch your rate of descent." (Oooh, the smarts of some people.)

We both suddenly realized that neither of us was flying the helo as the aircraft by itself headed for the drink. The air boss yelled at us a split second after we both had armpits full of collective, plus a little overtorque to keep out of the water.

Although we didn't get wet, we did have to terminate the flight.

Ever since that night, both of us have developed a positive method to pass control – just like the *good book* says. Overreaction? It might be a "skosh" over, but that one, simple, basic goof for us was almost a gotcha'. Maybe there's a lesson here for anyone flying aircraft with two people in the cockpit.

Controlmouse

Engine failure at low altitude in a single-engine aircraft is critical, especially in an aircraft not equipped with ejection seats.

LAND STRAIGHT AHEAD

NEAR the end of a T-28 training flight, the instructor set his student up for a PPEL (practice precautionary emergency landing). The student took the aircraft and, at high key, closed the throttle and put the prop to full increase. At low key, abeam the point of intended landing, the student advanced the throttle to 20 inches MAP, and the instructor opened the throttle further to 25 inches to clear the engine and ensure that waveoff power was available.

Closing the throttle again, the student continued to fly the aircraft through a high, fast approach to final. The instructor saw that the student would be unable to land on the first third of the runway and instructed him to wave off.

The waveoff was initiated at about 30 feet AGL, halfway down the runway. But, the student hesitated momentarily, so the instructor added more throttle. After initial engine response, at about 50 feet AGL, the engine suddenly lost power.

The instructor briefly considered turning to land on an intersecting runway, but rejected the idea because of the possibility of stalling with the steep angle-of-bank necessary to make the runway. He checked the throttle, prop lever, and mixture full forward and checked the fuel shutoff in the ON position. He noted flaps down and an airspeed of 110 knots.

By this time, it was apparent to the instructor that he would be unable to clear the trees at the end of the runway. He told the student they were going to crash, and the student braced himself. The aircraft descended at a 10-degree angle, crashing through numerous trees and contacted the ground about 1000 feet beyond the end of the runway.

The *Trojan* stopped with the airframe resting on top of the engine and the inboard portion of the starboard wing on fire. The canopy was blown open and although both pilots exited safely, the student experienced difficulty because he did not disconnect his radio cords. In addition, his travel through the underbrush was hampered by his parachute which had deployed.

The field crash crew arrived on the scene within 2 minutes and extinguished the fire.

The power loss was due to corroded magnetos and/or prop control linkage failure. When it became apparent that the aircraft would not clear the trees, the instructor maintained his flying speed and made the

decision to land straight ahead.

The IP chose, correctly, to concentrate on flying the aircraft to touchdown. This action minimized the possibility of loss of control and a catastrophic crash (stall-spin or cartwheel).

The phrase "don't stall – maintain flying speed – land straight ahead" is seldom heard outside the basic training command today. Yet, application of this ancient rule in this case enabled the pilots to walk away.

The following is one of a series of memorandums from the CO, VF-32, to his command. Its message is applicable to all carrier-based squadrons.

The Business at Hand

WOULD you believe that it is very difficult to find a more dangerous bag than what we *Swordsmen* are into? What this means is that each of us must take a look at what we are doing, how we do it, and consider our attitude toward it. Ask yourself some questions:

a. Is my work so routine that I really don't think about what I am doing?

b. Do I take shortcuts to complete a task sooner?

c. Do I try to work too fast?

d. Is getting the job done more important than how the job is done?

e. Do I ignore checklists because I know them cold?

f. Do I ignore other people's mistakes and unsafe practices because "it's none of my business"?

g. Do I wear appropriate safety gear?

h. Do I follow prescribed safety precautions?

i. Do I stay off the flight deck unless it is absolutely necessary to be there?

The correct answers hardly need be stated, but here they are: a) NO, b) NO, c) NO, d) NO, e) NO, f) NO, g) YES, h) YES, i) YES. Get any wrong? If you did, it's time to take a long, hard look at yourself as a professional. Not only are you risking injury, or worse, but you might not be quite the "pro" you think you are. In all honesty, it is true that each one of us would find it extremely difficult to make it through one day, let alone an entire deployment, and be able to answer all the above questions correctly.

What can we do? We can follow set procedures laid out in our MIMs, TIMIs, NATOPS, etc., and we can plan ahead. We can ask ourselves if we are being professional, and we can help the other guy, not by kicking him when he falters, but by helping him.

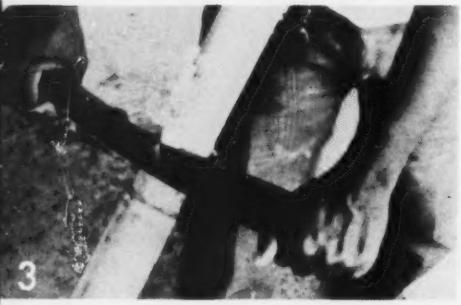
VF-32 is a team, a well-coordinated unit, and I have never seen a better one. We work well together, we are professional, and we have been safe. Nevertheless, we are susceptible, as is any squadron, to the accident caused by the little mistake, that tiny lapse, that moment of inattention to detail. So, let's keep it all together, let's maintain and perfect that winning attitude called professionalism. By doing so, we can avoid the mistake, lapse or inattention; and we can take everyone home with no more scars and the same number of fingers, hands, feet, etc. We're winners, and continued effort and thought will keep us that way both at work and on the beach.

The business at hand is working hard, playing hard, doing it right, and doing it safely, together. The payoff, when the work is done this way, includes many satisfactions. Prime among these is pride of workmanship. Continue to perform as you have, but bear in mind, to do so we must each take stock of how we are getting the job done, adjust our work habits and attitudes to optimize our efforts, and return to work better qualified. ◄

How to Get Lit on

Shave the bamboo with a *downward* stroke, your blade almost perpendicular to the surface to obtain fine shavings. This material will be your tinder.

Roll the shavings between your hands to break up the fibers. Once a ball is formed, pull it slightly apart to allow for air pockets.



Cut the bamboo with *upward* strokes at an acute angle to produce a "feather" or "fire" stick to be ignited by the tinder.

WHEN it's time to light the fire, we consider matches the primary source of ignition – convenient, and barring difficulties with wind, dampness, and improper preparation, easy to use. But a match is more efficient as a fire starter when you use it to ignite a candle or feather stick. Candles and feather sticks burn longer, are less likely to blow out, and provide more heat input to start your fire.

If you don't have matches or a lighter as your source of spark, you can use a "magic match" or any other form of flint.

If you don't have any of these fire aids, you can resort to one of the various friction methods. Of course, additional effort is required with the friction methods, and attention to details may mean the difference between success and failure. With proper preparation, however, the friction methods can be as fast as using a match or lighter.

The accompanying photographs and drawing *(made by the author at JEST [Jungle Environmental Survival Training] while serving as senior medical officer at NAS Cubi Point – Ed.)* illustrate the friction technique using bamboo. All you need is dry bamboo and a knife.

When collecting the bamboo, be aware of two things. First, upon examining the bamboo, you'll find that it has fine hairs on the outside – especially beneath the leaves at the joints. These hairs can irritate your hands. Brush the hairs off with your knife or a bamboo leaf or rub them off on the ground. The hairs on dead, dry bamboo are less of a problem than those on growing (green or yellow) bamboo.

Second, the dry, dead bamboo is often the nesting place for hornets or other insects. If there are holes in the bamboo, hit it before cutting it. This should flush out any insects inside.

(Dr. Barry acknowledges the assistance of the instructors and negritos of the JEST unit at NAS Cubi Point for demonstrating this firemaking technique. His most recent APPROACH article was "The 24-Hour Survival Kit," AUG '73 issue. – Ed.) ◄

Cut out a section of bamboo to provide a sharp edge on which another bamboo will ride, producing frictional heat. Make other cuts beyond the bamboo joints. Strips will be placed in these to hold down the section.

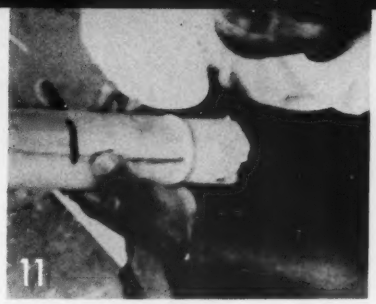
If two people are working to make the fire, make both cuts nearly, but not quite, 90 degrees to the cut section. Make the end cuts so the center cut section is nearly perpendicular to the ground. This is steeper than most survival texts indicate. However, it keeps your hand from being cut easily by the bamboo.

If only one person is making the fire, the end cuts should be perpendicular to each other. The distant vertical cut holds a stake driven into the ground. The horizontal end cut holds a bamboo kneeling strip (see photo 8).

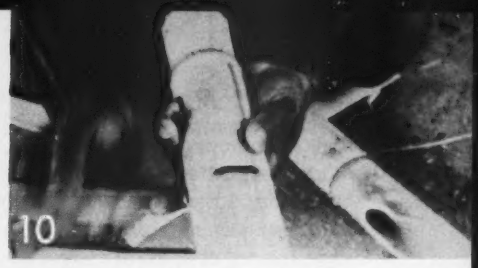
Split another bamboo section in half and make a thin groove lengthwise on the inside. Smooth the cut edges of this half-section to prevent injury to your hands. Make a pinhole to the outside in the groove.

Bamboo

Story, Photos, and Drawing
By LCDR William S. Barry, MC, USNR



Blow increasing amounts of air into the hole to provide oxygen to the smoldering ember. This spark should then catch, and the tinder should burst into flame. Use the burning tinder to light the feather stick which, in turn, is used to light the main firewood.



Lift up the smoking half-section and turn it over, still holding the tinder in place. Use a small sliver of bamboo as a pick to dislodge a smoldering ember into the tinder.

Initially, slowly and lightly rub the half-section along the cut edge. Build up speed and pressure as smoke appears.

Secure the cut section of bamboo on the ground, and put the notch of the half-section on the cut edge.

On the outside, at the point of the pinhole, make a small notch across the bamboo enlarging the hole slightly.

Place two tinder balls touching each other on either side of the hole. These should be held in place by a small strip of bamboo.

A vital principle that actuates total self-commitment to safe air operations.

EMPHASIS ON DISCIPLINE

By CAPT A. R. Barbin, USAF
Associate Editor *MAC Flyer*

DISCIPLINE means many things to many peopl
some, it conveys obedience, restraint, or punishm
others, discipline conjures self-control, o
conformity. These characteristics weave,
strengthen mental faculties and character so
some coveted objective. To aircrews, the o
and efficient operation of the aircraft.
discipline – is the common denomina
attainment of this objective.

The term air discipline has appea
frequency in aviation safety journa
including this one. Operational
reaffirmed the importance of instill
airlift mission. This concept is rec
emphasis, but what is air discipline
of? How is it developed and sustain

What Is It?

To professional aircrews, air d
mind which enforces self-contro
systematic accomplishment of co
Air discipline is an intangible com
it, touch it, or hear it. There i
manufactures it, or cockpit gage th
is present in varying degrees
Unfortunately, less in some than oth

Discipline, unlike hydraulic fluid,
be topped off with a known quantity
Its level is maintained by conditioni
priorities of the cockpit and g
overconfidence and complacency. The
disasters during recent years can be trace
both, of these underminers of air discipline.

What It Consists Of

Discipline consists of demonstrating will
resolve by adhering to a desired or prescribed pa
behavior. In flying, this pattern of behavior
unalterable commitment to follow the rules – all
time. It's a firm belief and conviction that the only wa
to a safe, efficient air operation is to apply 100 percent
of oneself to the job. It's based upon avoiding
complacent attitudes and overconfidence. Discipline
means consistently choosing to do the job as it was
designed to be done.

Developing Discipline

Developing sound, effective cockpit discipline involves consistent adherence to established operational procedures. Professionals in all occupations condition themselves to perform well consistently by developing good habit patterns. Over a period of time, these patterns of behavior become second nature and an integral part of the occupational routine.

Pilots are certainly no exception. They began developing safe cockpit habit patterns during undergraduate pilot training. Here, the unyielding instructor planted the seed from which this habit pattern ...ing could grow.

... initiative, guidance, and experience, the sapling ... a tree of disciplined behavioral responses we ...terns. But, a few allowed the sapling or tree to ... suffered the consequences. The rest sustain... ...atterns through their insistence on flying by t...

Altimeter se... ...erformance data, radar vectors, crew briefi... ...ft procedures are checked and rechecke... omitted. They won't allow it.

Attitude is a vital ingredient in the d... disciplined habit patterns. An attitude is a persistent disposition to act either positively or negatively. Without a positive mental posture toward cockpit responsibilities, a disciplined habit pattern certainly cannot evolve, and

safety of flight is seriously compromised.

A proper attitude is one which stresses importance to every cockpit function – no matter how insignificant it may seem. This attitude insists upon cross-checking radar vectors, sector altitudes, terrain, aircraft position, and MEAs. It ensures meticulous completion of checklists and briefings. It demands scrupulous attention and adherence to NATOPS procedures, major command operational policies, and other flight directives. And finally, it sustains the discipline necessary for safe, efficient mission accomplishment.

Sustaining Discipline

A championship football team maintains its enviable position throughout the season by sustained extra effort on the part of each team member.

The difference between a football team and an aircrew team is in the application of management. The coaching staff scrutinizes the success of every gridiron tactic and evaluates the performance of every player. If there is an ineffective play or substandard player, then it or he is withdrawn from the game.

When the gear retracts into the well, th[illegible] own – perhaps for a few hours or f[illegible] s no coach or wing commander calli[illegible] ensuring that the mission is saf[illegible] book. This responsibility [illegible] upon the aircraft [illegible] ber has a responsibility [illegible] using thoroughness.

[illegible] shortcuts, laxity, and complacency – the barometers of poor discipline. The temptation to fudge on weight and balance forms, accept clearance to FL370 when the charts indicate a performance ceiling of 34,600, withhold an aircraft discrepancy until well on [illegible]y to a desirable crew stop, sacrifice crew rest to [illegible] sights, neglect terrain and aircraft position [illegible] you're under radar vectors, or to close up the na[illegible] commencing descent are just a few.

[illegible]epetition, and monotony, brought on by long [illegible] days of globetrotting, can, if allowed, impair [illegible]ness, attitudes, and discipline. Checklist items a[illegible]ses become a meaningless series of slurred [illegible]. Little things are forgotten or overlooked [illegible]ample, altimeter settings, transition altitudes, [illegible] enroute altitudes, and descent checklists.

Sustaining [illegible]pline out in the system or around the flagpole [illegible] a total commitment to the rules – no sho[illegible] haphazard, minimum acceptable performances; [illegible]e enough for government work" attitudes; and n[illegible]cency.

[illegible]t Air Discipline

The relations[illegible]an and aircraft can be compared to a circle. A ci[illegible]iscipline. Part of the circle is the aircraft; the oth[illegible] crew. Aircraft are designed and structured to conform to the established disciplines of mathematics, physics, and aerodynamics. Yet, regardless of how closely an aircraft is disciplined during design and fabrication, a careless moment of crew indiscipline may reduce it to a smoldering mass of debris.

You, the pilot, navigator, engineer, or loadmaster, complete the circle of discipline. Crew actions produce predictable aircraft reactions. If these actions are disciplined, the circle remains intact, and safety of flight is virtually guaranteed. If not, the circle is broken, and safety of flight is compromised.

Courtesy *MAC Flyer*

THE LAST RUN OF FLIGHT NINE ONE FIVE

GREAT Sitkin Island thrusts its highest peak more than 5700 feet into the cold Aleutian air, its steaming volcanic gases occasionally blending leaden skies into the Bering Sea. Aviators familiar with the area are aware of the treachery that threatens during wintry days when the peculiar lighting, the 50-mile visibility, and the lack of color and detail make depth perception difficult. Few realize that depth perception is even trickier on a clear night. At times like this, the lights on neighboring Adak, almost 20 miles southwest across Sitkin Sound, seem only a couple of miles away.

On such a December evening, Flight Nine One Five, on a "milk run" from Whidbey via Elmendorf AFB, approached Adak at 10,000 feet. Flying toward the west, the pilot asked for a lower altitude. He was cleared to 9000 feet by Adak Approach. Although the sun had already set at Adak, at this altitude, sunset was half an hour later.

Weather was VMC with scattered layers at 4000 and 18,000. Fourteen minutes after the sun disappeared, Flight Nine One Five began its final descent from 40

miles out. The crew, looking forward to a cup of hot coffee in Operations, began to relax as they sighted the lights of Adak. They were scheduled to fly passengers back to Whidbey on Christmas leave.

Cleared for an NDB approach to Runway 23, the pilot picked out the runway lights over 30 miles away. Although he and his copilot had been to Adak before, they were not experienced Aleutian aviators. Indeed, a year had elapsed since their last visit. Published minimum sector altitude for an instrument approach to Runway 23 is 6800 feet MSL. Since the runway lights could be seen, however, the pilot probably planned a visual approach. The change to a visual approach was never reported because of conflicting radio transmissions. His night vision temporarily impaired by the recently departed sun, the pilot headed for the parallel lights of Runway 23. It was completely dark, but the clarity of the air lulled the aviators into a false sense of security.

Five minutes after commencing a descent toward Adak at 240 knots, Flight Nine One Five struck the lip of Great Sitkin Volcano at 5600 feet. The wreckage plunged into the caldera 1000 feet below, leaving a black streak on the snow 23 miles from Adak. In a few days, the howling winds and heavy snows of advancing winter took their toll, and the scattered remains of Flight Nine One Five became part of the Great Sitkin glacier.

(Discounting the fact that the pilot "busted" minimums by descending below the minimum sector altitude, his ability to see the runway 40 miles out no doubt contributed to a false sense of security. – Ed.)

The mishap involving Flight Nine One Five and these next two mishaps have common denominators:

Practicing a VOR approach to a military field in southwest Texas on a clear night, a T-33 crashed 6.8nm short of the runway. Although the pilot, who was under the hood, misread his altimeter by 1000 feet, the observer pilot in the front seat never realized anything was wrong. The approach was over unlighted terrain to a runway with a threshold 100 feet below the surrounding field elevation. The approach end is 14 feet below the runway midpoint.

On a cloudy night in the Midwest, the crew of an airliner was going through their checklist for a routine landing. The pilot was making a straight-in visual final over water toward a brilliantly-lighted city after having broken out of clouds at 8500 feet AGL on an IFR penetration. Visibility below the overcast was unlimited, and the runway lights could be clearly seen 20 miles away. Passengers straining to see something out of the window noted with relief that although everything beneath was dark, in the distance, a large and glittering pattern of lights was visible. Sensing he was high, the captain took off power and touched down *5 miles short of the runway.*

What *was* the common denominator in these accidents? All of them involved visual approaches over water or dark (unlighted) land toward a well-lighted city on nights when the visibility was exceptional. A survey of major commercial aircraft accidents revealed that one-third occurred during approach or landing. Almost half of these occurred at night over a darkened approach to a lighted city.

Officials at Boeing became concerned when four of their 727s crashed in quick succession at Chicago, Cincinnati, Salt Lake City, and Tokyo. Dr. Conrad Kraft, an Engineering Psychologist and Chief Scientist for the Personnel Subsystem of Boeing's Commercial Aircraft Division, began research into the landing-short phenomenon using a night-landing simulator.

Working with Dr. Charles Elworth and other Boeing colleagues, Dr. Kraft constructed a model of a lighted city on a table visible from a cockpit simulator. Stick and throttle inputs moved the table so that relative motion to the simulator could reproduce an approach from 34 miles out. Altitudes from 16,000 feet to minus 2500 feet could also be simulated.

After reviewing accident reports of night visual, short

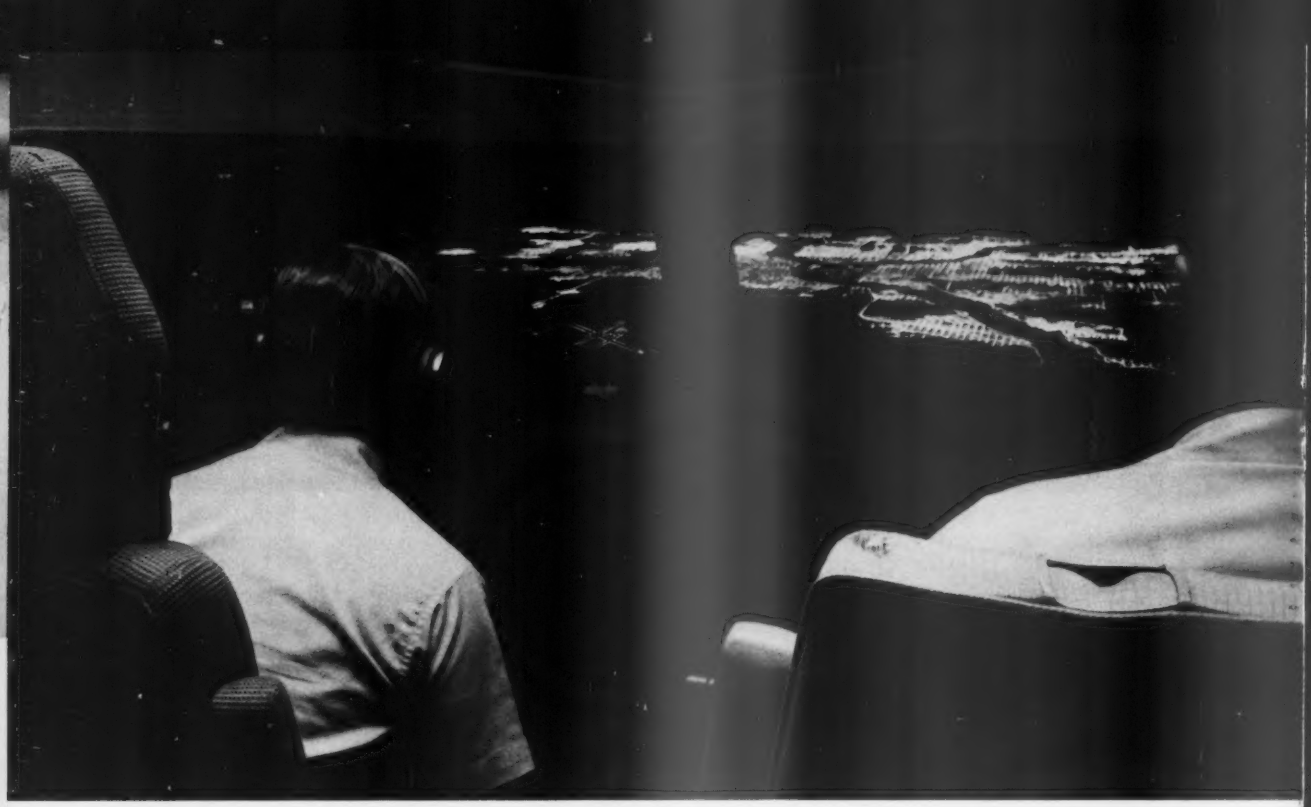


Fig. 1

landing accidents and analyzing night approaches in terms of the visual cues a pilot needs to maintain flightpath, Dr. Kraft had 12 of Boeing's most experienced captains fly the simulator. The average age of these instructor pilots was 44. They also averaged 10,700 hours flight time in all types.

Each captain was instructed to make a visual approach without an altimeter and judge his altitude above terrain. All other flight instruments were available. Half of the pilots made simulated approaches toward a city on a flat plane and the other half toward a city with a 3-degree upslope away from the approach end.

All of these highly experienced airline pilots felt it would be a "no sweat" task. *Eleven of the 12 landed short of the runway!* The only pilot who made it was an ex-Navy carrier pilot.

The pilots were shocked at the results, but Dr. Kraft concluded that they were being asked to solve a problem which exceeded normal human visual ability. It was no more pilot error than if the pilots had been asked to fly an aircraft requiring stick forces far exceeding normal human strength.

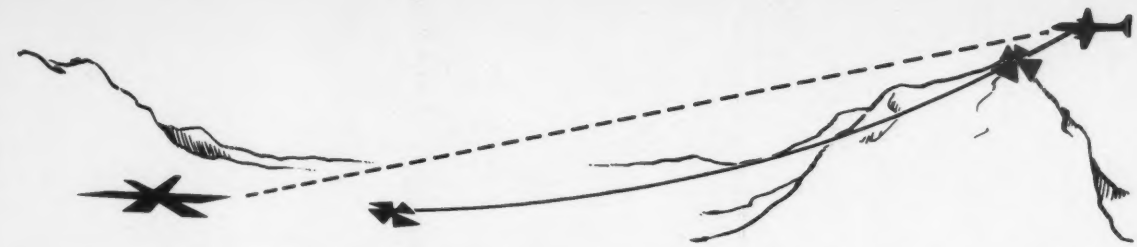
When the approach angle is relatively flat, there is little or no change in the visual angle. (The human brain cannot normally detect any change when the rate of change is less than 1 minute of visual angle per second.) If the runway has an upward slope, pilots, regardless of experience, are unable to judge altitude for a safe approach by vision alone. They all approached too low (Fig. 1).

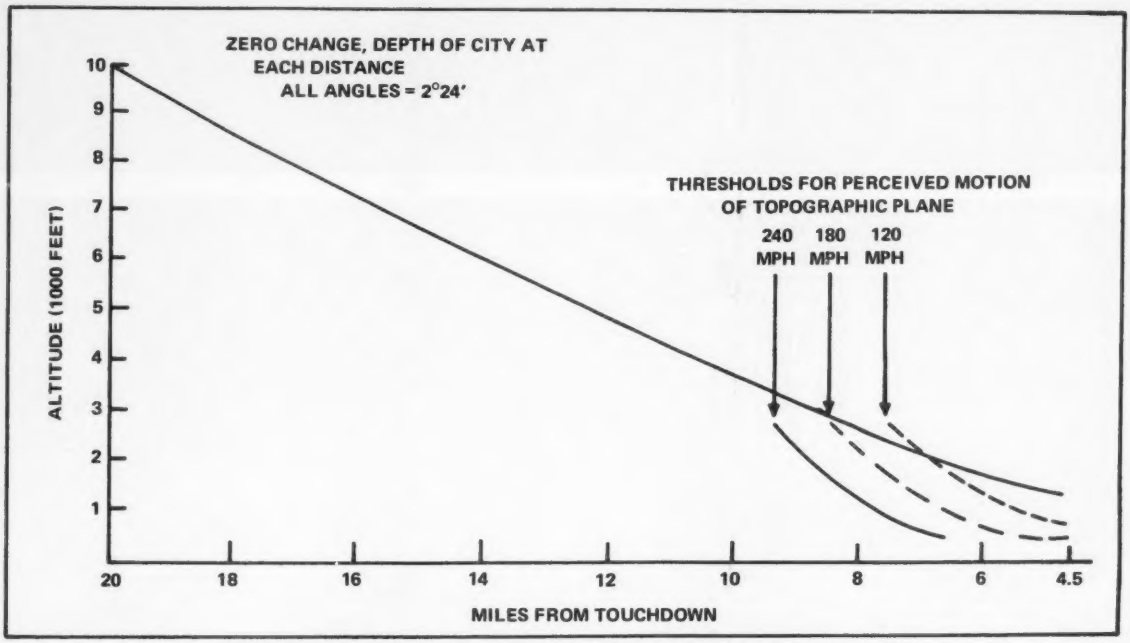
Dr. Kraft's research uncovered an unusual visual phenomenon. Although the visual line-of-sight is a straight line, the actual flightpath of the aircraft follows the arc of a circle whose center is located high above the city lights and whose circumference contacts the terrain short of the visual line-of-sight (Fig. 2).

In the case of the Adak mishap, the pilots never saw the ridge they hit. In fact, a tower operator at Adak predicted just such an accident last summer when he wrote to "Anymouse" (APPROACH, AUG '73, pg. 7) "... pilots of transient aircraft, unfamiliar with the airport, have made approaches that turn controller's hair gray. These pilots seem totally unaware of the mountainous terrain surrounding the runways and have had several near-collisions thereabouts."

He goes on to say, "... At this rate, I feel a disaster is inevitable..." Moreover, several incidents have occurred in the Aleutians in the past wherein pilots on approaches at night during VMC conditions have called the tower to inquire as to why the runway lights were turned off. Only when they were informed by the tower did they realize that there was a mountain between them and the airport!

According to Dr. Kraft, the following factors contribute greatly to the visual approach problem at night:





ZERO-CHANGE APPROACH PATH AND THRESHOLDS FOR PERCEIVED MOTION

Fig. 2

a. An approach over dark land or water where lights to the side and below the aircraft don't exist.

b. A long, straight-in approach to an airport located on the near side of a city.

c. A runway length-width relationship that is unfamiliar to the pilot.

d. The airport situated at a lower elevation and on a different slope from the surrounding terrain.

e. A navigational facility located some distance from the runway.

f. Substandard lighting of the runway and other landing aids unavailable.

g. A sprawling city within an irregular matrix of lights spread over various hillsides behind the airport.

h. Industrial smoke or other obscurations which decrease the brightness of lights as they interact with the distribution of lights about the airport. Remote airports near cities on irregular terrain are less safe on clear nights.

The lessons are obvious. When making a straight-in approach at night, include the altimeter in your scan, regardless of what your eyes tell you. Better yet, stay on the gages and let the copilot (if you have one) go visual. Study approach plates and airport layouts prior to landing at an unfamiliar field, and finally, at night, never, never bust published enroute and approach minimum altitudes – even when VMC.

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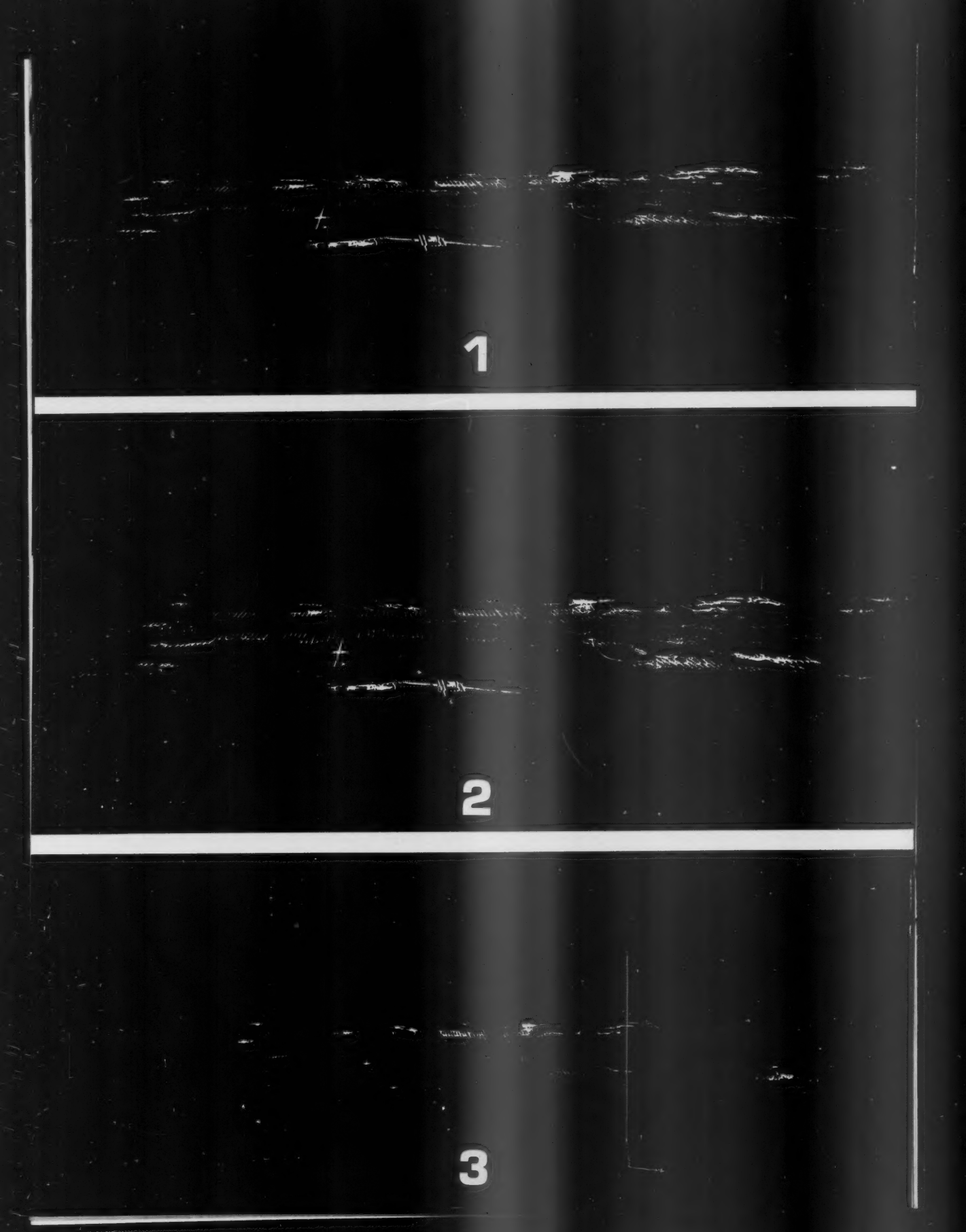
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Photo Quiz for Pilots

YOU are approaching the city of Nighterton in your particular type airplane; the runway is dead ahead, and you are cleared for a straight-in night visual approach. It's a beautiful, clear night; so without reference to your altimeter, by using just your thousands of hours of experience and your steely-eyed, expert judgment, tell us:

a. How far from the runway are you?

b. How high are you?

c. Can you tell if the city is on a flat plain or a sloping plane?

We know you can't be off more than a foot or two in altitude and, if you're as good as we are, probably a hundred feet or two in distance! Just to check your correct answers, turn to page 31.

ONLY SKIN DEEP

AN A-6A was engaged in daylight visual dive-bombing practice. On the fourth run (40-degree dive), the aircraft was observed to commence recovery slightly past the normal release altitude of 6000 feet AGL. It then pitched down slightly, rolled left, and struck the ground just beyond the bullseye. Neither crewmember ejected, and both were fatally injured. Investigators quickly determined that:

- The port wing separated from the aircraft during dive recovery. The wing had failed (broken) through a patched area on the lower tension skin above the No. 2 pylon.
- Approximately 5½ years prior to this mishap, the aircraft experienced a rupture in the port wing above the No. 2 pylon because of an Aero-7A-1 ejector bombrack failure. The wing damage was repaired locally at the intermediate level.
- The Structural Repair Manual did not authorize repair of this nature at the intermediate level without at least an engineering investigation and depot level approval. Nonetheless, it was done. It was impossible to determine if any engineering services were used. *The inferior patch design and extremely poor quality of workmanship, however, indicates that engineering services were not used.*
- The Aircraft Log Book *did not document the repair.* The only documentation of the repair was contained in a factory field technical service representative memo.
- Externally, the wing patch appeared to be professionally designed and executed. Internally, however, the radii of the corners of the cutout measured 0.3125 inches. These radii should have been a minimum of 1.0 inches. In addition, the edges of the cutout were not rounded or polished, and a necessary interior/backup structure was not installed.

Investigators concluded that this accident was caused by an improperly designed and executed patch of the port wing lower tension skin. Tool marks in the repair performed by an intermediate level maintenance activity *approximately 5½ years prior to the accident* created a stress concentration that generated the fatigue failure of the wing.

Hemotigersuperfluous

By LCDR D. C. Wynne
HS-5

THE SERVICE was simple, but meaningful. His friends were all there; from the squadron, from the BOQ, the club, and a few from out of town.

Few had heard of the disease before; even the flight surgeon had to dig into his books. But there it was, carved in stone and in the twisted heap that would forever jog our minds as we drive past the boneyard. Yes, there it was, a living and dying case of *hemotigersuperfluous*. Oh, you don't speak Latin? It means "Too Much Tiger Blood." It has killed or maimed many and scared hell out of all of us at one time or another. But there is a cure.

Hemotigersuperfluous is that insidious disease that most often strikes the young at heart, the 21-30 year olds. It seems that as you grow older, your system develops a natural immunity to the crippler. Some call it overextension, some say it's just excessive gung-ho or unharnessed spirit. Some say it can't be cured and even seem to encourage the malady. It *is* a disease, however, and must be eradicated along with other such insidious killers. What are the symptoms?

There was this prop pilot, a first tour gent trying to make a good impression, who was No. 2 in a weekend cross-country. He wasn't real sure of his machine when the starboard engine coughed and sputtered on level-off, but he wanted to make a good impression on the leader. He was a tiger, and he was determined to prove it. He was . . .

How about the HC type who was asked by the skipper of a nonaviation ship one night to fly ashore, deliver some mail, pick up some parts, and then return to the ship, underway, without TACAN, and under EMCON. Oh, yes, the weather was marginal, but that didn't deter our tiger; he was on his first cruise as O-in-C and wanted to show the CO that his squadron was a squadron of tigers. He was . . .

There are other similar examples, not limited to any particular community or even to any age. Some kids seem to never grow up. There are a few old, bold pilots, in spite of the old cliche. Trying to complete an assigned mission is commendable. Flying to impress others with our professionalism is laudatory. And doing our thing "round the clock" in all kinds of weather is a trait of the postal service that we should emulate, but . . .

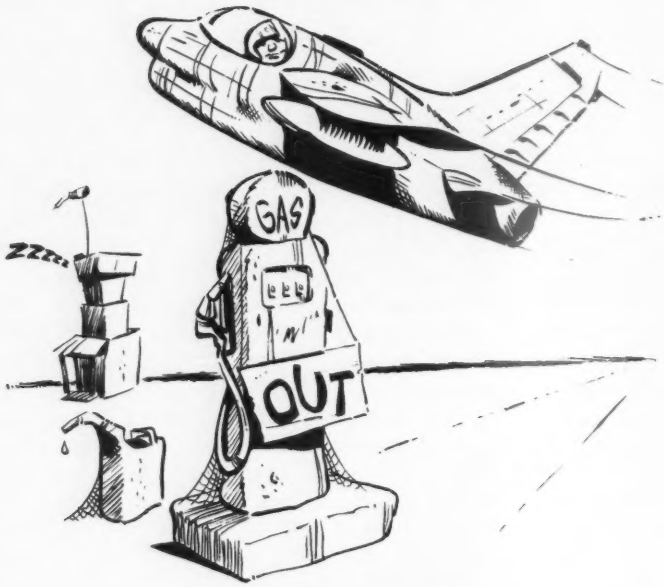
The blind "I Can Hack It" attitude is for kids, young kids, not mature professionals, proud of their service, and willing to strive for perfection. Overextension is not professional. Phoney "can do" does not belong.

What belongs is genuine ability coupled with a realistic appraisal of our individual capabilities and limitations and thorough knowledge of our flying machines and their capabilities and limitations. Saying "no" on occasion is professional, if that "no" is based on fact, presented with a cooperative but informative spirit. But it takes courage.

Place yourself in the boots of a 23 year old JG standing uncomfortably before a grey eagle who wants to know WHY he won't go. I've been there, so have you. The truth is, so has that grey eagle. Maybe that's why he's a grey eagle!

Too much tiger blood is a fatal disease. NATOPS, SOP, doctrine, common sense, and professionalism are the antidotes. Help stamp out hemotigersuperfluous. Get a transfusion of knowledge, stick to a diet of realistic appraisal, and lower your pressure factor. You, too, can one day be a grey eagle.

Anymouse



Surprise!

AFTER a record WestPac cruise, two pilots in our squadron planned a cross-country flight in older model A-7s. The flight was planned nonstop from NAS West Coast using droptanks. Both pilots thoroughly planned and briefed the flight . . . . or so they thought!

After nearly 5 hours in the wild blue, they were on GCA final at twilight with a comfortable gas reserve. The controller suddenly asked the flight leader if he was aware that no fuel was available to transients now nor for another 6 weeks. Needless to say, they were unaware of this, but diverted to a nearby AFB and still landed with the recommended reserve.

The error? *The notices in the aerodrome remarks section of the IFR Supplement were missed. That's where the information was listed* – not on the NOTAM board in base ops.

Cross-country mouse

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. These reports need not be signed. Self-mailing forms for writing Anymouse Reports are available in readyrooms and line shacks. All reports are considered for appropriate action.

REPORT AN INCIDENT
PREVENT AN ACCIDENT

Wait for Clearance

AN RP was flying a no-gyro PAR approach under the bag. The final controller transmitted, "Approaching glide slope, prepare to commence descent," or words to that effect. The RP started a 500 fpm rate of descent (contrary to SOP). No glide slope information was passed until at 3 miles when the IP asked the controller for glide slope information. No answer. At 2½ miles, the RP asked for glide slope information.

The first glide slope call during the approach was "Two miles from touchdown, slightly below glide slope." Glide slope information continued after touchdown.

After landing, the IP asked the controller about the lack of glide slope information. The controller stated that he did not pass glide slope information because the aircraft was never on glide slope and was never instructed to descend.

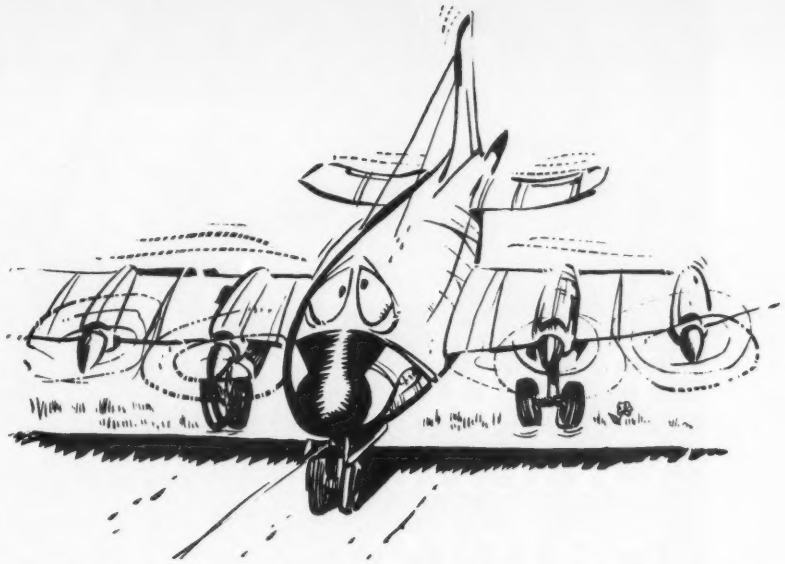
In actual instrument weather, it seems this would be a nice piece of information for a pilot expecting a PAR approach to receive.

GCAmouse

So the RP began his descent too soon. He made a mistake. But it was no mistake when the controller took no action to set things straight. Hope somebody put it on that smart a__ dude.

Incidentally, an informal telephone call was received at the Naval Safety Center recently from an FAA controller who stated that Navy pilots frequently commence a descent when told to "prepare" to descend. No way can "prepare" mean "do it." Be cool until instructed to actually descend.

Along for the Ride



WE were cleared for our final touch-and-go at an outlying field after having successfully completed approximately 20 bounces when the RP (replacement pilot) commenced his visual approach. The approach was slightly lower than optimal but seemed safe to both the RP and me (IPPC). To our chagrin, the mainmounts touched down short on the asphalt overrun. That, combined with riding over the runway lip, contributed to a 5G accelerometer reading.

The decision was made to abort the "go" and to visually inspect our *Orion* for damage. A QA team from Homebase was flown out, and a thorough inspection revealed no damage.

As the IP, I had to make the decision as to how far to let the RP go before taking over and obviously, in this case, it was too late. Contributing to the mishap, however, was my misjudgment of exactly how far back the mainmounts really are on the P-3. By the looks of the overrun, apparently more than one pilot has erred in this calculation.

Fortunately, I escaped from this incident with only wounded pride. The possibility of striking approach lights and their supporting towers (found at many other fields) does exist, however, and might someday result in a serious accident.

I now realize beyond any doubt why the P-3 (like many other large aircraft) is to be landed in the first 1000 feet of the runway and not just "in the box."

Bouncemouse

Debating Society

WEATHER conditions: Minimum ceiling 500 feet, visibility 1½ miles, max cloud tops 45,000 feet (Cbs). Thunderstorms 3-15 percent, turbulence moderate in the clear and in clouds; icing, moderate above 13,500 feet, mixed with heavy rain. A Cb is passing over the field, and there are numerous Cbs surrounding the field.

Now, some of you might say that's not bad, that you fly in weather like that all the time, but *we* don't. At this air station, we have IFR weather less than one percent of the year, and the type of flights that we are talking about are *training* flights. It is my opinion that:

1. You don't fly when there are imbedded Cbs surrounding the station.

2. You don't fly in icing conditions in aircraft not equipped for that purpose.

3. *You don't launch pilots who are flying on the average of less than 15 hours per month in these conditions.*

Nevertheless, we are receiving verbal abuse from the ops officer, XO, and others for refusing to fly. In my opinion, this is a lack of leadership on the command's part for not taking into account pilot proficiency and weather and for not stating that we will not fly until the Cbs have dissipated or until they can be visually avoided.

Instead, in this squadron, the decision was left to the individual pilots, all of whom (with a little – very little – coaxing by the ASO) decided it was not good headwork to launch.

We are fortunate in having level-headed pilots in our command, but some people would have been intimidated by the remarks, regardless of whether they were meant to be serious or not.

Weathermouse

You sure make it sound like some kind of rinky-dink outfit. I can't tell from here what the weather was really like, but "right or wrong, on third and long" the play has to be called by the quarterback (Ops) or the COach, not by free and open jive in the huddle.

People Oriented Safety

FPO, San Francisco – Consider yourself complimented if someone says of you, "he's people-oriented." This appears to be a popular expression of our day. Other phrases such as *"up with people"* and *"people who need people"* continue to work their way into our vocabulary. This is by no means an accident. More and more people are realizing that the simple act of taking an interest and displaying a genuine concern for the individuals around them is the key to making anything – any goal, any project – work successfully. So it is with the idea of safety in an aviation squadron.

Regardless of the form or shape a program to foster the spirit of aviation safety takes on, it must be grounded in the understanding and concern of the people within the program for the other people involved. It's a healthy sign if a squadron sees the individual. This attitude, in a very real day-to-day sense, is how each individual in a squadron can fit into the safety program.

To be successful, the safety program demands minute-by-minute concern and close attention to the detail of a task. Each individual must develop a safety consciousness, and this must permeate the entire organization. Not only must we be involved with the mechanics of our work if safety is to be improved, we must become involved with the personalities of those with whom we work. Safety consciousness must exist in every evolution, from flight and maintenance ground training to inflight procedures and tactics.

It must exist through the postflight corrections phase as well as in analysis sessions which seek ways to improve operating SOP. As we consider "nuts and bolts" ways to improve the mechanics of our operations, we must be aware of the impact each individual can have on improving the safety and safeguards of our operations.

Each of you can have an impact upon someone, in some way, each day, while doing your normal job. You can ensure, if you are working in corrosion control, that your partner has a set of goggles and is using them. While an engine is being changed, an extra minute may save your buddy's arm if you insist upon his working from a B-4 stand, instead of a shakey ladder. If you work in personnel and discover a sharp edge on one of the desks, take it upon yourself to get it repaired. Go out of your way to inform others of hazards. *Have an impact on someone else's life.*

The message of promoting safety through people-orientation must get through. If we are to respond properly to safety precautions, we must demand that those with whom we work respond favorably to situations. Take time to know people. Use your influence each day to influence those with whom you work.

When we give names and personalities in a squadron first priority, we have taken that important first step toward promoting safety. You can consider yourself complimented when someone says of you, "you're people-oriented." Besides being a positive direction toward safety promotion, you might just find that getting to know people is the most fun you've ever had – with your clothes on!

LCDR David Hilty
ASO, VP-46

notes from your flight surgeon

Dr. Fool

TAKING another's medicine is not only dumb, it can be downright dangerous.

A sailor aboard ship was being treated for a cold, but felt that the antihistamine prescribed was giving him no relief. A helpful shipmate had some penicillin tablets left over from a previous illness and offered one to his ailing buddy. About 30 minutes after the sailor took the tablet, he began having constriction of the chest, air hunger, pounding of the heart, hives, dizziness, and mental confusion.

At sickbay, he told the attending hospitalman what he had taken. His pulse was pounding, and the HM was unable to get a blood pressure reading. He was placed on oxygen and emergency medication. Slowly he began to respond. At the end of 2 hours, he was apparently out of danger. He remained on medication throughout the night without incident.

Although the sailor had taken penicillin before for other illnesses without any trouble, this time he suffered a penicillin reaction. Fortunately, prompt medical attention was available, and he is still with us, presumably somewhat wiser after his narrow escape.

Taking medication prescribed for someone else is a hazardous business. Somebody once put it more bluntly, "He who self-medicates has a fool for a doctor."

Don't.

Heads Up

HEADS up on the flight deck, and make sure all the men in your squadron remember it.

An AOAN was crossing the No. 2 elevator enroute to the island. He saw an A-6 manned by a plane captain and assumed that the aircraft would not be turning. The A-6's jet blast blew him over the side.

"Man overboard" was promptly sounded over the 1MC. The plane guard helo picked him up, and he was back aboard 8 minutes later.

He was wearing all the required safety and survival equipment prescribed for flight deck personnel.

First Means

THE FIRST means of locating a survivor was once again the signal mirror.

Medical Officer's Report

Lethargy, Complacency

"ALTHOUGH having no bearing on the accident itself, the following comments further support the lethargy and complacency mentioned previously in this AAR," says an endorser.

- The pilot was wearing a Mk-3C lifevest with which he was unfamiliar.
- The RIO had a blown bladder on his anti-G suit. It was not considered important because it wasn't a G-pulling flight. Nevertheless, intercepts were conducted while waiting to commence carquals.
- The pilot's chinstrap was not fastened.
- The RIO's helmet visor was not lowered. Also, it can be presumed that his oxygen mask was improperly attached/fitted because it went up over his eyes.
- The qualified rescue crewman of the SAR helicopter (a SAR school graduate) was of the opinion that *the pilot's helmet could be discarded* for better communication. This would not have provided protection for the pilot when he was subsequently hoisted into the helicopter. ◄

B. C.

LOOK, LOOK, ..SEE DICK PREPARE THE FIRE FOR THE BARBECUE
SEE THE FIRE DWINDLE
SEE DICK SQUIRT MORE FUEL ONTO THE DYING FLAMES
SEE DICK DO HIS FAMOUS IMPERSONATION OF A MUMMY IN WARD SIX

Letters

He who deliberates fully before taking a step will spend his entire life on one leg.

Chinese proverb

Still Cutting Out

Camp Pendleton – Some time ago, two UH-1Es were scheduled to pick up a VIP party. While the members were climbing aboard, an aviator passenger darn-near walked into a tail rotor. The helicopters were parked in front of the tower with No. 2 in No. 1's 5-o'clock position.

The aviator, assigned to No. 2, bolted from the aircraft just after No. 1 had received clearance to taxi. He was returning the general's cover to him – which must have seemed more important than keeping his head.

The pilot of No. 2, seeing what was taking place, requested No. 1 not to move. The aviator barely missed running into the tail rotor of No. 1.

In this day and age of jet aircraft, however, too many people have forgotten the ageless teaching "Beware of props and rotors – they kill." Devotion to job, duty, and *headwork* have to go hand-in-hand in a profession such as ours, with so many latent dangers.

Name withheld

• **The following anonymous quote from the early days of aviation still applies: "No instrument has yet been devised to keep the human brain from intermittently cutting out."**

Ironclad Protection

USNH Naples – I got quite a chuckle out of the comments from CAPT Carneghi *(See "VP Flight Time," DEC '73 APPROACH. – Ed.)* of COMPATWING TWO as we were arguing this question 10 years ago when I was Flight Surgeon with FAW-2 and serving with VP-22. No one cared much about the total hours, etc., until there was an incident or accident, and then . . .

The squadron CO is caught in the middle – he gets the blame if the commitments can't be handled due to time limits, but he also hears about it if an overflown crew is involved in an accident.

I have always felt the hours limitation should be ironclad to protect the CO from the "can-do" attitude often required by the operational chain of command.

Dr. R. L. Anderson

Physical Fitness

San Diego, CA – Kudos for the excellent article "This Is Your Life" in the FEB '74 issue.

Here at NAS Miramar, through a series of articles in the station newspaper, we have endeavored to enlighten our aircrew and base personnel about the metabolic dangers of the typical American diet and lack of exercise.

In addition, the "usual" physiology lectures have been modified, incorporating the important aspect of physical fitness, to provide the aircrewman with a full spectrum of information relating to survival.

Our returning POWs have also emphasized the importance of physical fitness during their captivity. It would be prudent for all of us to heed their advice as well as that of the American Heart Association.

As an avid jogger, I would like to pass on some of the more pragmatic words of scripture which may be of significance to your physical well-being: I Corinthians 9:14, "so run that ye may obtain."

CDR M. Passaglia, Jr., MSC
APTU, NAS Miramar

• **Amen.**

Hypoglycemia

St. Louis, MO – Re the first Anymouse account in your DEC '73 issue, there is one other interesting possibility explaining Hypoxicmouse's symptoms. Admittedly, the level of carboxyhemoglobin formed by two to three packs of cigarettes a day is fierce and would compound his hypoxia problem at 10,000 feet. His symptoms, however, sound very much like hypoglycemia (low blood sugar).

With the acknowledged history of drinking, it would be interesting to know if he ate breakfast, and if so, what and how much. Weakness, dizziness, anxiety, and tremor grab me as more typical of hypoglycemia than hypoxia.

G. J. Womack, M.D.
Manager, Aerospace Medicine
McDonnell Douglas Astronautics
Company – East

APPROACH welcomes letters from its readers. All letters should be signed, though names will be withheld on request.

Address: APPROACH Editor, Naval Safety Center, NAS Norfolk, VA 23511. Views expressed are those of the writers and do not imply endorsement by the Naval Safety Center.

FLIP Changes

THE DEFENSE Mapping Agency, St. Louis, MO, has notified the Naval Safety Center of the following changes to FLIP documents:

• *FLIP Planning Cycle Change.* The publication cycle for the FLIP Planning, Section IIA, Military Training Routes, United States and associated charts, will be changed to a 12-week cycle subsequent to the 25 April 1974 issue. The presently scheduled PCN cycle for this publication will be changed to a 4- and 8-week cycle and will no longer be published on a cumulative basis.

• *Data to be Deleted.* The Aerospace Center and Military Departments are embarking on a program to eliminate extraneous, redundant, and unnecessary information from FLIP Planning and the FLIP Enroute Supplement. The initial effort will be directed toward the U.S. products, and follow-on action will be taken in the publications for overseas areas.

Dependent upon the success achieved in the domestic area, a narrow band of screen (dot pattern) containing solid arrows pointing inward, ahead of and following information to be eliminated or relocated, to another product will be printed for two issues before action is taken. A new paragraph titled Data Deletions to contain a tabular listing of those items to be deleted or relocated along with a cutoff date has been added to the NEW FLIP FEATURES.

A written request for continued publication of this data must be forwarded through the appropriate addressee identified in the FLIP General Information Corrections paragraph so as to arrive at the Aerospace Center prior to the cutoff date shown in the tabular listing.

UFO

NAS China Lake – Your comment to the UFO letter in the FEB '74 APPROACH indicating that no known insect would be flying at 1500 feet definitely does not correlate with my experience. I have frequently encountered insects at 7-10,000 feet over the Mojave Desert in the springtime where ground elevations were on the order of 3-4000 feet.

Splatter marks on aircraft windshields and noses definitely indicated insects and not small birds; my guess has been grasshoppers, locusts, or butterflies.

CDR Charles D. Brown

Kudos

Moody AFB – As a fledgling pilot, I can already appreciate the Navy's informative magazine APPROACH. The articles covered in the magazine are invaluable in that they give insight into how, and occasionally why, accidents and incidents happen. The experiences of these unfortunate pilots serve to guide other pilots clear of the difficulties that sometimes arise that could have been avoided.

The style of the magazine is one that is appealing and refreshingly different. The accounts of the accidents and incidents are not given in the matter-of-fact way that is associated with accident briefs. They are presented in such a way that one can identify with the aviator and feel that one is witnessing the same experiences as encountered by the pilot. The dry, factual reporting method of the usual accident brief more or less removes one to a purely analytical viewpoint.

Lastly, the magazine emphasizes safety of flight, the importance of following procedures, and the use of checklists as the guiding principles of aviation.

The reason for this letter is to compliment you and your staff for the effort put forth in the production of this magazine, to ask that the magazine staff be ever vigilant of the quality and standards of the magazine as is now being done, and to simply say thanks for making a magazine of this caliber possible.

G. W. Sims
2nd LT, USAF

APPROACH vs PLAYBOY

NAS Patuxent – Just read the MARCH '74 edition of APPROACH. Consider your back cover picture inappropriate. Are you succumbing to the likes of other safety-oriented periodicals which feel you have to have "alluring beauties" to get your message across?

What's next, a centerfold? Suggest you get back on track – if you haven't already lost the bubble!

You wouldn't want PLAYBOY to substitute pictures and stories on aviation articles *instead* of its present fare, would you?

CDR Anonymous, USN

• Only if they were done in good taste and helped prevent accidents. ◄

Answers to Photo Quiz

1.	a. 20 miles	b. 10,000 ft	c. 3° slope
2.	a. 20 miles	b. 10,000 ft	c. 1.5° slope
3.	a. 34 miles	b. 15,840 ft	c. 3° slope
4.	a. 20 miles	b. 15,840 ft	c. flat
5.	a. 34 miles	b. 15,840 ft	c. flat

Vol. 19 **approach** No. 10

RADM W. S. Nelson
Commander, Naval Safety Center
Publisher

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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This month's cover by Chuck Witcher, courtesy McDonnell Douglas, depicts a "trection" of multiple-mission F-4J *Phantoms*. Pg 29 "B.C." by permission of John Hart and Field Enterprises, Inc. IBC Cartoon: Robert Osborn.

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FUEL EXHAUSTION

ALL fuel exhaustion accidents fall into two broad categories. First are those that involve total fuel exhaustion because of being lost or wherein flight planning is inadequate and exhaustion occurs short of destination. The second includes accidents in which main fuel cell fuel is exhausted with fuel remaining in other tanks but is either nontransferrable or is unintentionally not transferred.

Adherence to the following "common sense" rules will prevent total fuel exhaustion:

1. In planning each flight, allow for adequate fuel reserve at destination with fuel reserves for expected delays. This planning is appropriate for shipboard and shorebased local flights as well as cross-country flights.

2. Maintain a fuel "howgozit" on every flight and execute the alternate plan (devised prior to takeoff) when the "howgozit" indicates "nogozit."

3. Shipboard operations require that aircrews, shipboard controllers, and selected divert fields are orchestrated, i.e., an aircrew reaches a predetermined fuel state and reports same. Shipboard controllers signal and coordinate a tank or divert, and the selected divert field is ready to receive the aircraft. While it *can* be as simple as "chopsticks" – orchestrated, in all cases, it requires a professional baton in CATTC.

4. Aircrews must track their geographical position at all times. When lost, they must admit it. The old adage "Climb, conserve, confess" is appropriate. Don't override common sense with ego.

5. Do not ignore the low fuel warning light. Those who do will ultimately do so once too often.

Main fuel cell exhaustion (fuel transfer difficulty) occurs under the following circumstances and can be eliminated by the indicated action.

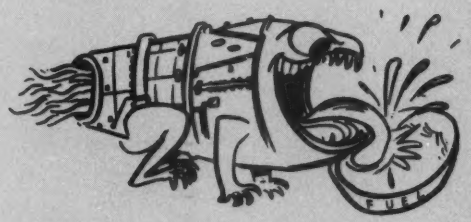
1. Mismanagement of the fuel transfer system because of ignorance of the system or an error in switch position. Remedy: know the fuel system. Adequate knowledge will result in proper switchology, and fuel quantity monitoring will become second nature during normal operations. Hence, timely recognition of switch mispositioning will ensue.

2. Fuel transfer/indicating system malfunction. Remedy: again, thorough knowledge of the fuel system. This knowledge must include the operations of valves, floats, etc., through all conceivable failures such as electrical, bleed air, hydraulic, etc. Knowledge of the entire system will also permit recognition of an unusual valve/indicator failure through proper interpretation of cockpit instruments.

3. Dichotomies between cockpit fuel indicators: Most aircraft are equipped with two independent fuel measuring systems – the low level warning system and the fuel quantity indicator system. Occasionally, conflicts between the two occur. Remedy: When either system indicated low fuel, consider the worst, i.e., low fuel, and react accordingly.

Fuel exhaustion accidents are presently high on the risk list. An added hazard that magnifies this susceptibility is the current energy crisis. Don't stretch fuel because it is not available at a particular enroute stop. Don't fuel an aircraft with a light load without considering possible contingencies. In effect, don't let the fuel crunch crunch you or your airplane. Common sense in fuel planning and management will make it so.

Adapted from COMNAVAIRLANT msg



Of all the fields in naval air that are long overdue (read "ripe") for improvement, fuel systems have to be near the top of the list. Birds are still coming off the assembly line with **built-in** *fuel transfer problems! Why can't SYSCOM and the contractors make this system as automatic and trouble-free as the 8-day clock? Building a megabuck aircraft with fuel feed control dependent on human-memory circuitry (often routinely short circuited by distractions) just doesn't make sense today. – Ed.*